

1. An exhaust muffler for an internal combustion engine, comprising

a casing;

said casing including a front wall, a rear wall and a side wall;

said side wall extending in a loop about said front and rear walls, said front wall including an exhaust gas inlet and said rear wall including an exhaust gas outlet;

a first compartment wall;

said first compartment wall including a first central circular passage and a first pair of side circular passages, said side circular passages of said first pair of side circular passages being respectively located equally spaced on opposite sides of said first central circular passage; and said side circular passages of said first pair of side circular passages being smaller in area than the area of said first central circular passage,

a second compartment wall;

said second compartment wall including a second central circular passage and a second pair of side circular passages, said side circular passages of said second pair of side circular passages being respectively located equally spaced on opposite sides of said second central circular passage; said side circular passages of said second pair of side circular passages being smaller in area than the area of said second central circular passage;

said first compartment wall being mounted in said casing behind said front wall of said casing with said first central passage of said first compartment wall being aligned with and spaced from said exhaust gas inlet and with the outer periphery of said first compartment wall being in contact with said side wall of

said casing to define a first compartment within said casing;

said second compartment wall being mounted in said casing spaced in front of said rear wall of said casing with said second central circular passage in said second compartment wall being aligned with said exhaust gas outlet in said rear wall of said casing and with the outer periphery of said second compartment wall being in contact with said side wall of said casing to define a second compartment in said casing;

first and second gas divider baffles;

said first gas divider baffle for dividing a first side circular passage of said pair of side circular passages in said first compartment wall into a plurality of passages, said first gas divider baffle being positioned behind said first compartment wall in confronting relationship with said first side circular passage of said pair of side circular passages;

said second gas divider baffle for dividing a second side circular passage of said pair of side circular passages in said first compartment wall into a plurality of passages, said second gas divider baffle being positioned behind said first compartment wall in confronting relationship with said second side circular passage of said pair of side circular passages;

a first elongate tubular member, said first elongate tubular member having an axis and front and rear ends, and being of a first predetermined diameter and first predetermined length; said first tubular member including an entrance at said front end for receiving exhaust gas within the interior of said tubular member and an exit at said rear end for permitting exit of exhaust gas from the interior of said tubular member;

said first elongate tubular member being positioned inside said casing in between said first and second compartment walls with said entrance at said front

end being aligned with said central opening in said first compartment wall for receiving exhaust gas from said first compartment and with said exit at said rear end being aligned with said central opening in said second compartment wall for permitting exhaust gas to exit into said second compartment;

said first elongate tubular member including a plurality of small gas passages through the side of said first elongate tubular member for permitting passage of exhaust gas between the interior and exterior of said first tubular member;

said plurality of small gas passages in said first tubular member being arranged in a plurality of rows, each of said rows extending longitudinally of said first tubular member, said rows of said plurality of rows being equally angularly spaced about said axis of said first tubular member; and

a third divider baffle located in the interior of said first tubular member;

said third divider baffle being positioned at said entrance of said first tubular member and extending inside said first tubular member a first predetermined longitudinal distance along said axis of said first tubular member for dividing a portion of the interior of said first tubular member into a plurality of sectors, wherein exhaust gas entering said tubular member is divided into a plurality of streams of exhaust gas over said first predetermined longitudinal distance.

2. The exhaust muffler as defined in claim 1, wherein said plurality of passages in said first and second divider baffles comprises four and wherein said plurality of sectors defined by said third divider baffle comprises four.

3. The exhaust muffler as defined in claim 2, wherein each of said front and rear walls of said casing comprises a circular geometry, and wherein said sidewall of said casing comprises a cylindrical geometry.

4. The exhaust muffler as defined in claim 3, wherein each of said first and second compartment walls comprise a cylindrical geometry.
5. The exhaust muffler as defined in claim 1, wherein each of said first, second and third divider barriers each comprise first and second flat rectangular panels, each of said panels including a slot extending part way through the midsection of the respective panel; said panels being interlocked by said slots in a crisscross relationship.
6. The exhaust muffler as defined in claim 1, wherein said plurality of rows of small gas passages in said first tubular member comprises six and wherein the number of small gas passages in each said row comprises six.
7. The exhaust muffler as defined in claim 4, wherein each of said first, second and third divider barriers each comprise first and second flat rectangular panels, each of said panels including a slot extending part way through the midsection of the respective panel; said panels being interlocked by said slots in a crisscross relationship; and wherein said plurality of rows of small gas passages in said first tubular member comprises six and wherein the number of small gas passages in each said row comprises six.
8. The exhaust muffler as defined in claim 7, wherein said plurality of rows of small gas passages in said first tubular member comprises six and wherein the number of small gas passages in each said row comprises six.
9. The exhaust muffler as defined in claim 1, further comprising:
 - a fourth divider baffle;
 - said fourth divider baffle being located in the interior of said first tubular member positioned at said exit of said first tubular member spaced from said third divider baffle and extending inside said first tubular member a second predetermined longitudinal distance along said axis of said first tubular member

for dividing a portion of the interior of said first tubular member adjacent said exit into a plurality of sectors, wherein exhaust gas passing through the interior of said tubular member to said exit of said tubular member is divided into said plurality of streams of exhaust gas over said second predetermined longitudinal distance and exits said tubular member as a plurality of streams of exhaust gas.

10. The exhaust muffler as defined in claim 9, further comprising:

a second tubular member, said second tubular member being of a second predetermined length and diameter and having front and rear ends, and including inwardly tapered frusto-conical front and rear end portions;

said second predetermined diameter of said second tubular member being greater than said first predetermined diameter and said second predetermined length being approximately equal to said first predetermined length; and

said second tubular member being mounted coaxial with, supported by and ensleeving said first tubular member, with said front and rear end portions abutting said first tubular member, to define an annular chamber between said first and second tubular members.

11. The exhaust muffler for an internal combustion engine as defined in claim 10, further comprising:

a gas deflector;

said gas deflector being located in said gas exit region between said second central circular passage of said second compartment wall and said exhaust gas outlet for blocking direct propagation of exhaust gas exiting from said first tubular member from direct access to said exhaust gas outlet of said muffler and deflecting exhaust gas off the axis of said first tubular member.

12. The exhaust muffler as defined in claim 8, further comprising:

a fourth divider baffle;

said fourth divider baffle being located in the interior of said first tubular member positioned at said exit of said first tubular member spaced from said third divider baffle and extending inside said first tubular member a second predetermined longitudinal distance along said axis of said first tubular member for dividing a portion of the interior of said first tubular member adjacent said exit into a plurality of sectors, wherein exhaust gas passing through the interior of said tubular member to said exit of said tubular member is divided into said plurality of streams of exhaust gas over said second predetermined longitudinal distance and exits said tubular member as a plurality of streams of exhaust gas.

13. The exhaust muffler as defined in claim 12, wherein said plurality of sectors defined by said fourth divider barrier comprises four.

14. The exhaust muffler as defined in claim 13, wherein said fourth divider barrier comprises first and second flat rectangular panels, each of said panels including a slot extending part way through the midsection of the respective panel; said panels being interlocked by said slots in a crisscross relationship.

15. An exhaust muffler for an internal combustion engine, comprising

a casing;

said casing including a front wall, a rear wall and a side wall, said front wall including an exhaust gas inlet and said rear wall including an exhaust gas outlet;

a first compartment wall;

said first compartment wall including a first central circular passage and a first pair of side circular passages, said side circular passages being located on

opposite sides of said first central circular passage and being equally spaced from said first central passage; said side circular passages of said first pair of side circular passages being smaller in area than the area of said first central circular passage,

a second compartment wall;

said second compartment wall including a second central circular passage and a second pair of side circular passages, said side circular passages of said second pair of side circular passages being located on opposite sides of and equally spaced said second central circular passage; said side circular passages of said second pair of circular passages being smaller in area than the area of said second central circular passage;

a first tubular member, said first tubular member having an axis and front and rear ends, and being of a first predetermined diameter and first predetermined length; said first tubular member including an entrance at said front end and an exit at said rear end; and said entrance and exit being aligned along said axis of said first tubular member;

a second tubular member, said second tubular member being of a second predetermined length and diameter and having front and rear ends, and said second tubular member including inwardly tapered frusto-conical front and rear end portions;

said second predetermined diameter of said second tubular member being greater than said first predetermined diameter and said second predetermined length being approximately equal to said first predetermined length;

said second tubular member being mounted coaxial with and supported by and ensleeving said first tubular member, with said front and rear end portions

abutting said first tubular member, to define a first annular chamber between said first and second tubular members;

said first tubular member including a plurality of small gas passages in the side of said first tubular member for permitting passage of exhaust gas between the interior of said first tubular member and said first annular chamber;

said plurality of small gas passages in said first tubular member being arranged in a plurality of rows, each of said rows extending longitudinally of said first tubular member, said rows of said plurality of rows being equally angularly spaced about said axis of said first tubular member;

said first compartment wall being mounted in said casing transverse the axis of said first tubular member with said first central passage of said first compartment wall being aligned with and spaced from said exhaust gas inlet and said front wall of said casing and with the outer periphery of said first compartment wall being in contact with said wall of said casing to define a gas entry region in said casing; and

said second compartment wall being mounted in said casing transverse said axis of said first tubular member and spaced from said rear wall of said casing with said second central circular passage in said second compartment wall being aligned with said first central circular passage of said first compartment wall and with the outer periphery of said second compartment wall being in contact with said wall of said casing to define a gas exit region in said casing; and

wherein said first and second compartment walls, said wall of said casing and the exterior of said second tubular member defining a second annular region in said casing;

wherein said side circular passages of said first pair of side circular passages of said first compartment wall provide passages into said second annular region for a portion of exhaust gas introduced within said gas entry region through said exhaust gas inlet; and

wherein said side circular passages of said second pair of side circular passages of said second compartment wall provide passages from said second annular region for exhaust gas in said second annular region to pass into said gas exit region;

said first tubular member being mounted in said casing extending between said first and second compartment walls with said entrance of said first tubular member being coupled to said first central circular passage in said first compartment wall to permit exhaust gas entering said exhaust gas inlet to enter said interior of said first tubular member and with said outlet of said first tubular member being coupled to said second central circular passage of said second compartment wall to permit exhaust gas exiting said first tubular member to pass into said gas exit region and to said exhaust gas outlet;

first and second gas dividers located in the interior of said first tubular member, said first and second gas dividers being spaced apart along said axis of said first tubular member;

said first gas divider being positioned at said entrance of said first tubular member and extending inside said first tubular member a first predetermined longitudinal distance along said axis of said first tubular member for dividing a front portion of the interior of said first tubular member into four sectors;

said second gas divider being positioned at said rear of said first tubular member and extending inside said first tubular member a second predetermined longitudinal distance along the axis of said first tubular member for dividing a rear portion of the cylindrical interior of said first tubular member into four sectors;

said first gas divider being oriented about the axis of said first tubular member by a first angular extent and said second gas divider being oriented about said axis of said first tubular member by a second angular extent, whereby said four sectors defined by said first gas divider are out of alignment with said four sectors defined by said second gas divider;

third and fourth gas dividers;

said third gas divider being positioned in said second annular region and in one of said circular side passages of said first pair of side circular passages of said first compartment wall and said fourth gas divider being positioned in said second annular region and in the other of said circular side passages of said first pair of circular side passages of said first compartment wall;

each of said third and fourth gas dividers for parsing into four parts exhaust gas entering said second annular region through the respective circular side passages.

16. The exhaust muffler for an internal combustion engine as defined in claim 15, further comprising:

a gas deflector;

said gas deflector being located in said gas exit region between said second central circular passage of said second compartment wall and said exhaust gas outlet for blocking direct propagation of exhaust gas exiting from said first tubular member from direct access to said outlet of said muffler and deflecting that exhaust gas to the sides off-axis of said axis of said first tubular member.

17. The exhaust muffler for an internal combustion engine as defined in claim 15, wherein said angular spacing between said plurality of longitudinally extending rows of said small gas passages in said first tubular member is equal.

18. The exhaust muffler for an internal combustion engine as defined in claim 17, wherein said plurality of longitudinally extending rows in number comprise four.

19. The exhaust muffler for an internal combustion engine as defined in claim 15, wherein said small gas passages comprise louvers, said louvers facing said inlet end of said first tubular member.

20. The exhaust muffler for an internal combustion engine as defined in claim 19, wherein the number of small gas passages in each row of plurality of rows of small gas passages comprise six.